

CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA
4

August 18, 1944

Dr. Warren Weaver
The Rockefeller Foundation
49 West 49th Street
New York, New York

Dear Warren:

When I was in New York in February I mentioned to Dr. Hanson a plan for post-war research which I have been thinking about recently. I am now outlining this plan to you in order that I may have the benefit of your advice.

Dr. Robert B. Corey and I are supervising a war research project at this Institute on which about forty chemists, with Bachelor's or Doctor's degrees, are employed. The work which is being done is in a large part pretty respectable scientific research. We have an organization which is now working with extreme efficiency. The men carry on their work under a system of orders and reports; orders for individual investigations are issued by Dr. Corey, and the investigators then prepare reports on their work.

I suggest that, when the war comes to an end and presumably a large number of well-trained young scientists will be looking for employment, we set up a research project designed to operate in this same efficient way, for the purpose of making a very vigorous attack on the problem of the structure of proteins and related substances.

We have available in the Gates and Crellin Laboratories apparatus for x-ray investigation of crystals and the determination of the structure of gas molecules by electron diffraction. We also have a set of punched cards and punched card machines for carrying out the numerical calculations that are necessary in x-ray and electron diffraction work in a far more efficient way than has been available hitherto. The years of experience which we have had in the x-ray field, with especial attention paid to the protein problem in recent years, provides us with sufficient background to enable us to make plans for a research program which will without doubt provide a great amount of information. We know what can be done by diffraction methods--we know that it is possible to determine in complete detail the structure of crystals of amino acids, peptides, prosthetic groups of proteins such as the heme group, and other relatively simple substances related to proteins, and that also a great deal of information presumably could be obtained about proteins themselves, by direct attack. We also know that the amount of labor required to obtain this information is very great, and that progress will be correspondingly slow unless more vigorous methods are used than have been used in the past. Dr. Corey, working full-time, with the aid of one assistant, was able to make a complete structure determination of an amino acid crystal in between one and two years. I believe that, with the aid of the labor-saving devices which

August 18, 1944

we have developed, a well trained full-time research assistant working under careful supervision could be expected to carry out an equivalent job now in about one year. The essence of my plan is that we would have perhaps twenty such research assistants working on a unified program under the direct and detailed supervision of Dr. Corey, Professor J. H. Sturdivant, Dr. Verner Schomaker, and myself, with the labor apportioned among the research assistants so as to get the work done in the most efficient way.

In addition to this structural work, we would make studies of porphyrins and their metal salts and other prosthetic groups of conjugated proteins by chromatographic and spectrophotometric methods, would carry out investigations of various physicochemical properties of hemoglobin and chlorophyll, and would use all appropriate techniques for learning as much as possible about the nature of these important substances and others of biological significance.

The program which I have in mind is, then, one which involves a staff of perhaps twenty full-time assistants, including people with Bachelor's or Doctor's degrees, a couple of typists to take care of the orders and reports, and computers and routine assistants. The project would presumably begin immediately after the end of the war, when men are being dropped from OSRD projects; it should, I think, continue for at least three years. The cost of the project for a three-year period would be approximately \$150,000.

I am enthusiastic about the possibilities for fundamental scientific progress which this plan affords. The protein problem is a great one, and its solution will not be easy. This plan is not going to solve the problem. I think that the problem can be solved only by a very great amount of very hard work. We know enough about the experimental methods of structural chemistry to be sure that a large amount of progress can be made by applying these methods, and we know that the progress will be made only by putting in a great amount of effort; my proposal is that this effort be applied in three years, instead of in twenty.

I shall be very glad to know whether or not you think that this plan is a sensible one. Do you think that it would be worth while for the California Institute of Technology to submit a request to The Rockefeller Foundation for a grant, to be made for the purpose of carrying it out? If so, would it be appropriate for the request to be made before the end of the war, in order that the plan might be put in operation immediately at the end of the war?

I shall be pleased when it again becomes possible for me to see you occasionally and to talk to you.

Sincerely yours,

Linus Pauling

LP:jr